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FISHERY RESEARCH

Job Performance Report
Project F-73-R-16

ANGLER COMPLIANCE AND ATTITUDES TOWARD WILD TROUT MANAGEMENT

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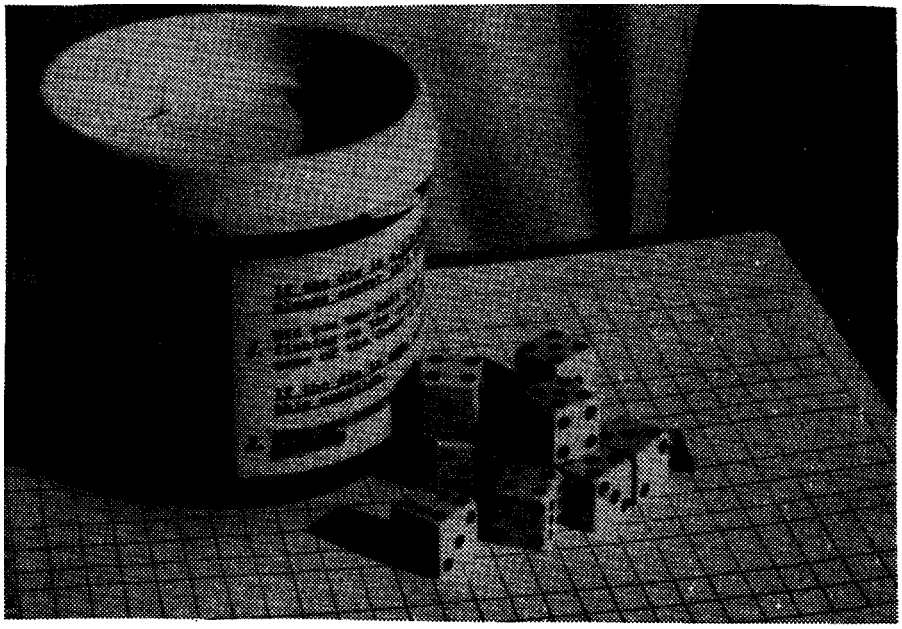

Job 3. Estimation of Angler Non-compliance on Special Regulation Waters in Idaho using Random Response

by

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***JOB* PERFORMANCE REPORT**

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Project: F-73-R-16

Name: Angler Compliance and Attitudes Toward Wild Trout Management

Title: Estimation of Angler Non-compliance on Special Regulation Waters in Idaho using Random Response

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ABSTRACT

Total compliance is often assumed when developing special regulations but probably does not occur. We sought to quantify angler non-compliance on three Idaho streams using Random Response (RR), a technique designed to quantify embarrassing or criminal behavior. We searched for associations between both positive RR responses and angler regulation awareness across a number of demographic variables. Illegal use of bait and creeling of trout within two catch-and-release zones ranged from -0.4 to 3%. Compliance with barbless hook regulations on the same zones was poor (29%) but nearly 75% of these violations were accidental. Creeling of illegal-sized trout was a more common violation (5 to 8%) on two zones managed with a minimum size regulation. Non-Compliance with a restriction that directly effects or limits harvest was greatest on Henry's Lake where 9.5% of anglers violate the two-fish bag limit each angler day. We observed highly significant associations between the type of regulation and angler ability to correctly recite them on a given stream. A number of demographic variables including age,residence,and gear type used were also associated with regulation awareness. We conclude that RR is a viable method to estimate angler compliance with special regulations. Additional analyses are needed to evaluate potential biological effects of above rates on associated trout populations.

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INTRODUCTION

Fishing regulations typically require various levels of restraint from the public. The Idaho statewide general trout limit of six fish requires little sacrifice for most harvest-oriented anglers because few fishermen exceed such a bag limit in a typical angling day (Hunt 1970; Thurow 1990). Special regulations often require anglers to return much of their catch and alter gear use (bait restrictions, barbless hooks). An individual angler may or may not choose to comply with such regulations, but special regulations typically result in increased fish sizes, densities, and angler catch rates (Behnke 1987; Wydoski 1977; Anderson and Nehring 1984).

Perhaps because of the success associated with special regulation areas, 0% angler non-compliance is often assumed when developing regulations for individual waters. Angler non-compliance is typically not considered or even mentioned in regulation modeling exercises (Thurow 1990; LaBolle and Schill 1988; Espegren et al. 1990; Clark 1985).

In fact, angler non-compliance with regulations could effect the success of special regulations. Paragamian (1984) concluded that angler noncompliance with special regulations in a smallmouth bass Micropterus dolomieui fishery could be the main factor blocking attainment of management objectives. Gigliotti and Taylor (1990) demonstrated via simulation, that a relatively small amount of angler non-compliance could effect salmonid stock structures and densities in a typical catch-and-release fishery. Lewynsky (1986) concluded that angler non-compliance was a factor in the poor response of the westslope cutthroat trout Oncorhvnchus plarki lewisi stock in the North Fork Coeur d'Alene River to special regulations. Even advanced attempts to manage exploited wildlife populations may be confounded without estimates of illegal harvest (Smith et al. 1989).

Compliance with fish and game laws is difficult to assess. Violators often successfully hide evidence of violations from enforcement personnel during contacts. Resultant estimates of compliance based on routine contacts can be misleading (Cowles et al. 1979). Several techniques including undercover contact§ (Smith and Smeltzer 1991), clandestine observations (Lewensky 1986; Rohrer 1991), violation simulation (Stork and Walgenbach 1973), and random response (Lewynsky 1986; Rohrer 1991,Smith 1989) have been used on rare occasions to estimate non-compliance with fishery regulations. Methods for using these techniques are confusing, logistically difficult, and/or expensive. Consequently, few estimates of violation rates are available and quantification of violations has been identified as a top enforcement research need (Beatie and Giles 1979).

The objective of this study is to estimate the frequency of special regulation violations on three Idaho waters. We use and evaluate Random Response (RR) as a tool to quantify angler non-compliance.

Besides quantifying the prevalence of poaching, RR surveys can be used to investigate associations with other categorical variables (Fox and Tracy 1986). Results of demographic categorization could aid in prioritization of

enforcement efforts (Beatie and Giles 1979). Perhaps the biggest benefit of such an effort would be to examine the demographics of violators and focus education efforts on those angler groups most likely to violate (Smith 1989; Glover and Baskett 1984). A secondary objective of this study is to classify anglers demographically in terms of regulation awareness and propensity to violate restrictions.

Random Response Technique

A large volume of literature, primarily in statistical and sociology journals, describes RR methodology. It is a technique to gather unbiased data on sensitive issues that could embarrass or criminalize individuals. Warner (1965) pioneered the RR concept and Greenburg et al. (1969) refined the initial model by introducing the Unrelated Question survey. This method uses two unrelated questions, one potentially stigmatizing, and one completely benign. A randomizing device provides privacy by denying the interviewer knowledge of which question the respondent is answering.

As originally conceived, the un-related question model requires two independent random survey samples. The probability of respondents being asked the sensitive versus the unrelated question is determined by the randomizing device in both samples. In the first sample respondents are asked to answer a sensitive question with probability P and the unrelated question with probability (1-P). In the second sample, the probabilities of answering the two questions are reversed. Using this data the true proportion of individuals answering yes to the sensitive question ($\tilde{n}_A$) can be estimated (Greenburg et al. 1969).

Numerous authors (Horvitz et al. 1976; Moors 1971; Folsom et al. 1973) expanded on the original unrelated question model. Greenburg et al. (1969) pointed out that selecting an un-related question in which the probability of obtaining a yes response ($\tilde{n}_Y$) is known is superior to the above model and requires a single random sample to estimate ($\tilde{n}_A$). For example, if we wanted to estimate the proportion of Idaho residents who illegally fished with multiple rods last season, an appropriate unrelated question might be, "Were you born in the month of April?" The probability of obtaining a yes answer to the second question could be obtained from license records and would eliminate the need for a second sample.

Random Response has received scant attention as a method of estimating fishing violations despite promise shown in a few studies. Lewynsky (1986) and Rohrer (1991) both used RR surveys in Idaho to estimate the incidence of regulation violations in special regulation waters. These studies found that non-compliance with special regulations on two waters consistently exceeded 10%. Schill and Kline (1994) noted mathematical errors in their methods, however, and recalcalculated estimates for both waters. Although a number of the revised estimates indicated low non-compliance rates, several remained above 20% when calculations were corrected. Thus, based on the results of Gigliotti and Taylor (1990), non-compliance could play an important role in Idaho special regulation fisheries.

Study Site

We conducted RR surveys on a total of five study sections on three Idaho waters (Figure 1). Henrys Lake is a shallow, highly productive lake covering 2,630 hectares in eastern Idaho. It supports an extensive salmonid sport fishery for yellowstone cutthroat trout Oncorhvnchus clarki bouveri, brook trout Salvelinus fontinalis, and cutthroat trout O. clarki-rainbow trout 0. mvkiss hybrids. Seasonal effort on the lake has ranged from 125,000-365,000 angler hours in the last decade (Tom Herron, Idaho Department of Fish and Game, unpublished data). The fishery is supported by both wild and hatchery trout. Anglers are restricted with a two-trout bag limit (any species) with no terminal gear restrictions.

The St. Joe and North Fork Coeur d'Alene rivers originate near the Idaho/Montana border and flow westerly for 150-200 km until entering Coeur d'Alene Lake. Westslope cutthroat trout and mountain whitefish Prosopium williamsoni are the predominant gamefish species. Hatchery rainbow trout are planted in lower portions of both drainages and are managed via the statewide general bag limit of six fish. Special regulations have been used to protect wild cutthroat trout from over-exploitation on both streams since the mid-1970s. Regulations for cutthroat trout include catch-and-release (C&R) with barbless hooks on upper segments of both drainages including tributaries. Lower segments of the two streams are managed with a one-fish bag limit and a minimum size greater than 14 in (1 > 14"). Bait is not excluded in the 1 > 14" zones but is prohibited within the C&R zones.

Survey Design

We conducted angler interviews on the two stream fisheries from the season opener (May 29) to August 28, 1993. We divided this period into 2-week intervals and randomly selected one weekday per interval to conduct interviews on each stream. We alternated weekend interviews on the two streams systematically and contacted anglers on both Saturdays and Sundays. Thus, anglers were contacted a total of 3 d on each stream per interval. We contacted all anglers fishing the C&R and 1 > 14" zones on scheduled interview days (Smith and Smeltzer 1991). Interviews were conducted from 0630 to 2100 h.

Survey dates on Henrys Lake ran from the season opener (May 29) to September 5. We sought the same type interview schedule, but severe weather on the lake eliminated virtually all angling activity on many scheduled days. We rescheduled these days in a non-random fashion as dictated by personnel schedules. The size of Henrys Lake coupled with the intense angling effort prohibited us from contacting all anglers on interview days. We interviewed anglers bank fishing near campgrounds, the Idaho Department of Fish and Game (IDFG) fish hatchery, and along the major shore fishing area referred to as "the cliffs". We contacted boat anglers at all boat ramps and associated campgrounds. When interviewing large groups of anglers during busy ramp

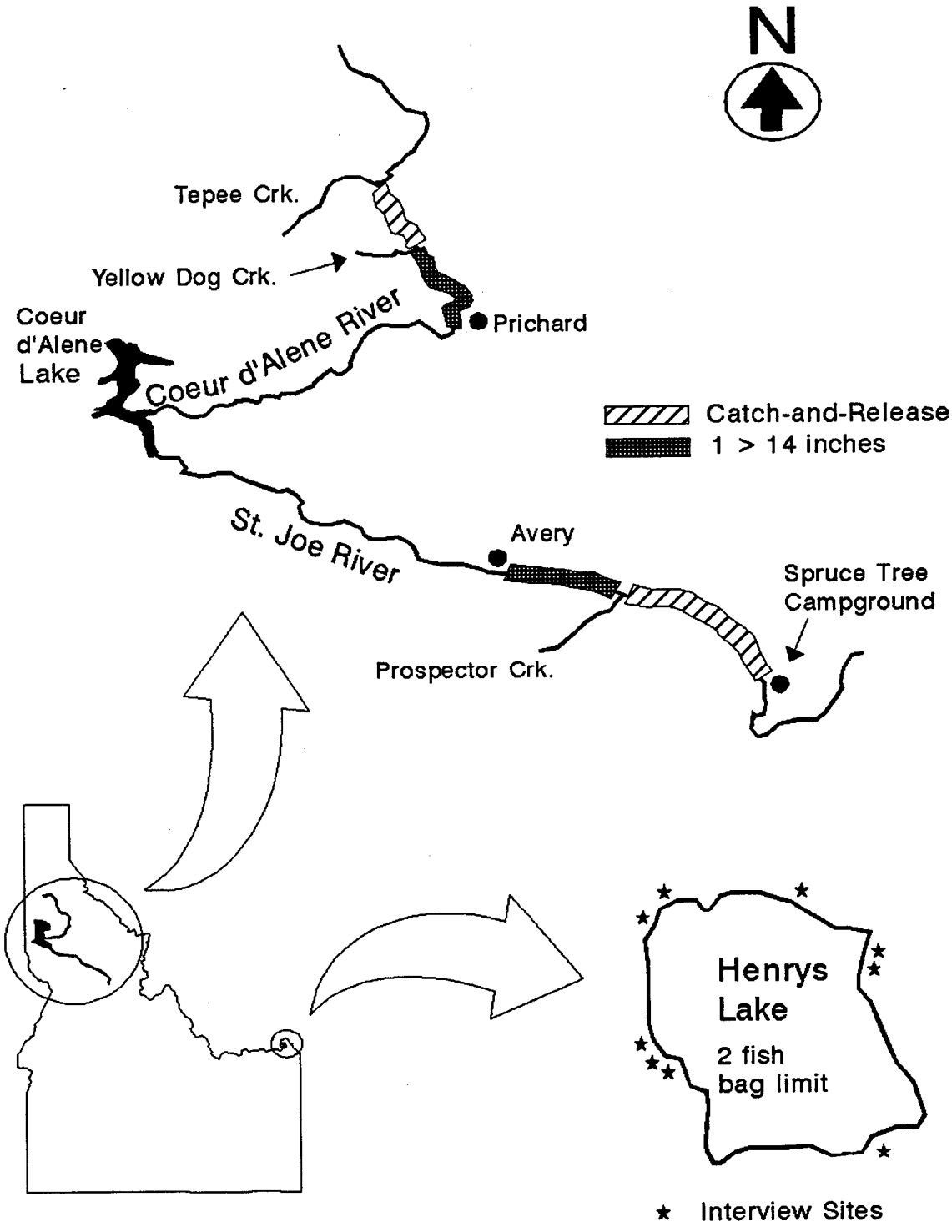

Figure 1. Location of regulation zones evaluated in the 1993 Random Response Study.

hours, we randomly selected one or two anglers from each group using a random number target (Reaser et al 1975).

Questionnaire

When first approaching anglers we identified ourselves as IDFG biologists (not enforcement officers) and asked how fishing was to relax the respondents. We recorded sex and placed anglers into six age categories. We only included anglers over 14 years old in the study.

To reduce the likelihood of anglers lying to us despite the RR methodology we sought data on their last fishing trip; not the present one. We asked anglers if they had fished this water before (between appropriate zone boundaries) and if they could remember details of the trip. If they responded yes to both questions, we continued. If anglers had not fished the zone before, we terminated the interview.

We classified anglers by residence. If anglers resided in the same administrative Region of Idaho Fish and Game as the water in question, we denoted them local anglers (LO). All remaining resident anglers were classified as Idaho anglers (ID). Non-resident Anglers were classified separately (NR). Also, because of their numeric importance, we classified anglers from the eastern one third of Washington state separately (EW) on the northern Idaho stream fisheries. We asked anglers which type of terminal gear they used on the trip in question.

Prior to asking the RR questions we informed anglers that the remaining portion of the interview was unusual in that it involved a game of chance. We then explained the study purpose to participants. For example, in the case of the North Fork Coeur d'Alene River, the major objective of the survey was to determine if "poaching" was the primary factor preventing special regulations from producing better numbers and/or sizes of cutthroat trout. On all waters we assured anglers that individual compliance was not of interest to us but that by sampling a large number of anglers an overall compliance rate could be derived.

Our randomizing procedure was nearly identical to Shotland and Yankowski (1982). We used a 6-sided die placed in a lidded coffee mug as the randomizing device. There were two questions (sensitive and unrelated) printed on the side of the cup. The numbers one, two, three, four, and five were printed next to the sensitive question. The number six was printed next to the unrelated question. Anglers were instructed to shake the cup, remove the lid and observe the number without informing the interviewer of the result. They were then asked to pair up the die number with the appropriate question on the side of the cup and answer yes or no without informing the interviewer which question they were answering. Interviewers did not maintain eye contact with anglers during this process. Anglers were then instructed to shake the cup to eliminate our ability to examine the number.

We repeated this procedure with several cups that pertained to multiple restrictions on the waters in question if appropriate. For example, we used three separate cups to ask anglers if they were complying with the 0 fish creel limit as well as bait and barbless hook restrictions on the C&R zones. Our question concerning barbless hooks asked whether they intentionally violated this regulation. During the first week of July we added an additional survey question for the two C&R zones that pertained to accidental use of barbless hooks (Table 1). We sought to determine how often anglers occasionally forgot to crimp down and/or use barbless hooks, even though they knew the regulation.

We used "Were you born in the month of April?" as the unrelated question in all cases. The value of ($\tilde{n}_Y$) was obtained by examining the 1993 Idaho license database. We divided the total number of anglers born in April by the total number of anglers to derive the proportion (0.08).

To expect honest responses from violators, anglers must clearly understand how they are afforded privacy. We stressed that the interviewer had no knowledge of the dice roll outcome and that a yes answer did not identify them as a violator because of way the "game" works. For those who appeared confused we made a practice run using a hypothetical example.

We reminded anglers several times during interviews that we were biologists (not enforcement personnel) and that the regulation questions pertained only to their last trip on this stream zone. After completing the RR interviews, we asked anglers if they could recite the regulations for the zone in question.

We calculated non-compliance estimates for specific regulations using the formula of Greenberg et al. (1969) where the unrelated characteristic is known:

$$\pi_A = \frac{\hat{\lambda} - (1-P)\pi_y}{P} \qquad (1)$$

with variance =

$$\frac{\lambda(1-\lambda)}{nP^2} \qquad (2)$$

where:

π_A = **estimated proportion of anglers violating the regulation in question.**

$\hat{\lambda}$ = **proportion of yes answers in the survey.**

P = **probability of obtaining the regulation question from the dice roll = 0.83.**

Table 1. Summary of random response questions used to interview anglers about their last fishing trip on five separate regulation zones in Idaho, May through August 1993.

Water	Regulation[a]	Question	Sample size
St. Joe River	C&R	keep any cutthroat trout	297
St. Joe River	C&R	use bait	297
St. Joe River	C&R	use barbed hooks intentionally	297
St. Joe River	C&R	use barbed hooks accidently	154
St. Joe River	1>14"	keep more than 1 cutthroat trout	174
St. Joe River	1>14"	keep any cutthroat trout <14"	174
Coeur d'Alene River	C&R	keep any cutthroat trout	185
Coeur d'Alene River	C&R	used bait	185
Coeur d'Alene River	C&R	use barbed hooks intentionally	185
Coeur d'Alene River	C&R	use barbed hooks accidentally	93
Coeur d'Alene River	1>14"	keep more than 1 cutthroat trout	207
Coeur d'Alene River	1>14"	keep any cutthroat trout <14"	207
Henrys Lake	any 2 fish	keep more than 2 trout	195

[a] C&R = catch and release, 1>14" = 1 fish>14" creel limit.

$\Pi_Y = 0.08 =$ the proportion of anglers with the non-sensitive attribute = 0.08

$\lambda = P(\pi_A) + (1-P)\pi_Y =$ probability of receiving a yes answer in the survey (Greenberg et al. 1969) (3)

We approximated 95% confidence limits using the formula:

$$\pm 2\sqrt{var} \quad (4)$$

Model Validation

We used surreptitious observations (Lewensky 1986) to validate the RR technique. During early June, we drove along the St. Joe C&R zone and selected 37 possible sites where anglers could be discretely observed from concealed locations. We assigned these observation posts (OP) a number. From June 27 to August 27, project personnel, IDFG enforcement officers, and cooperating volunteers observed anglers fishing the stream near these sites. Personnel typically dressed in drab or camouflage clothing and used spotting scopes and/or binoculars to facilitate observation. We spent a minimum of 6 h at each OP.

Each angler fishing an OP was classified according to their compliance with the bait restriction and zero fish bag limit. We made no attempt to ascertain the frequency of barbed hook use from a distance. Personnel also recorded both the number of minutes fished and fish caught for each angler.

Sampling dates were not randomized. On days when personnel were available, a lottery type drawing was conducted to determine the OP location to be watched. This assignment was done without replacement to guarantee that all OP sites were observed during the season.

In addition to the site-specific work above, one local conservation officer (CO) spent 6 d patrolling the St. Joe C&R Zone. For comparison with our RR results for barbless hook use, the officer attempted to contact all anglers fishing in the C&R zone on his patrol days. In some cases, he drove up in full view of anglers, left the vehicle and initiated contact. Whenever possible, he would observe the angler covertly for up to 1 h before initiating contact. The officer recorded confirmed barbless hook violations. A number of anglers changed or broke off flies as the CO approached. We believe most of these anglers were in violation of the barbless hook regulation and included them in the estimate. A total of 115 anglers were contacted either directly, or surreptitiously by the IDFG CO. We compared results from this work to the frequency of barbless hook violations estimated by RR.

We calculated 95% confidence limits around the validation estimates using the standard proportion formula with correction for continuity (Fleiss 1981).

Violator Demographics

We summarized angler responses to regulation questions by demographic categories. For each zone we calculated the proportion of several demographic groups (sex, residence, gear type, age years of education, and time of week interviewed) that could recite the special regulation correctly and who answered "yes" to 1 or more of the RR questions for individual restrictions. We also pooled data for the stream study sections (excluding Henrys Lake) together and tested relations among demographic variables and responses to the regulation questions. We used a chi-square test of association to make statistical comparisons at the 0.05 significance level employing Yates correction when necessary (Zar 1974).

RESULTS

Angler awareness of regulations was much better in the C&R zones than on 1 > 14" zones on both northern Idaho streams. An average of 94% of anglers interviewed on both C&R zones could recite the regulations; 70% could do so on the 1 > 14" zones. Within both streams, these differences were highly significant (Table 2).

Based on the 1,058 anglers interviewed with RR, there was a wide range of compliance with special regulations. Our non-compliance estimates for individual restrictions on the five study sections range from -0.4-29.1% for each angler day.

On the two C&R zones, angler compliance with restrictions that directly limit harvest was good. We estimate the incidence of bait use and creeling of cutthroat trout at 2.9% of angler-days on the Coeur d'Alene River. Less than 0.4% of anglers on the St. Joe River violated the same restrictions (Figure 2). Our estimate for anglers creeling trout on the St. Joe river was -0.4% with an upper confidence bound of 1%.

Angler compliance with the barbless hook restriction on both C&R zones was poor; overall compliance with the barbless regulation was 28.6 and 29.1% per angler day, respectively. About 75% of these violations were accidental (Figure 2).

Compliance on the two 1 > 14" zones varied by individual restriction. Coeur d'Alene River anglers were about twice as likely as St. Joe River fisherman to creel more than the legal one-trout limit but both rates were low (Figure 3). In contrast, St. Joe River anglers were more likely to violate the minimum size limit. Eight percent of the St. Joe River anglers we interviewed harvested cutthroat trout less than the legal limit on their last angler day compared to 5.3% on the Coeur d'Alene River.

Non-Compliance with a restriction that directly effects or limits harvest was greatest on Henrys Lake. We estimate that 9.5% (t5%) of anglers violated the two-fish bag limit during the interview period. Much of this illegal

Table 2. Regulation awareness for anglers fishing two Idaho special regulation waters, May through August 1993.

Water	Regulation[a]	Aware of regulation ($3	Sample size		Significance
Coeur d'Alene River	1>14"	68	156	x^2=24.5	p < 0.001
Coeur d'Alene River	C&R	91	164 /		
St. Joe River	1>14"	72	148	x2=49.2	p < 0.001
St. Joe River	C&R	96	280 /		

[a] C&R = catch and release, 1>14" = 356 mm = 1 fish >14" creel limit.

TAB2

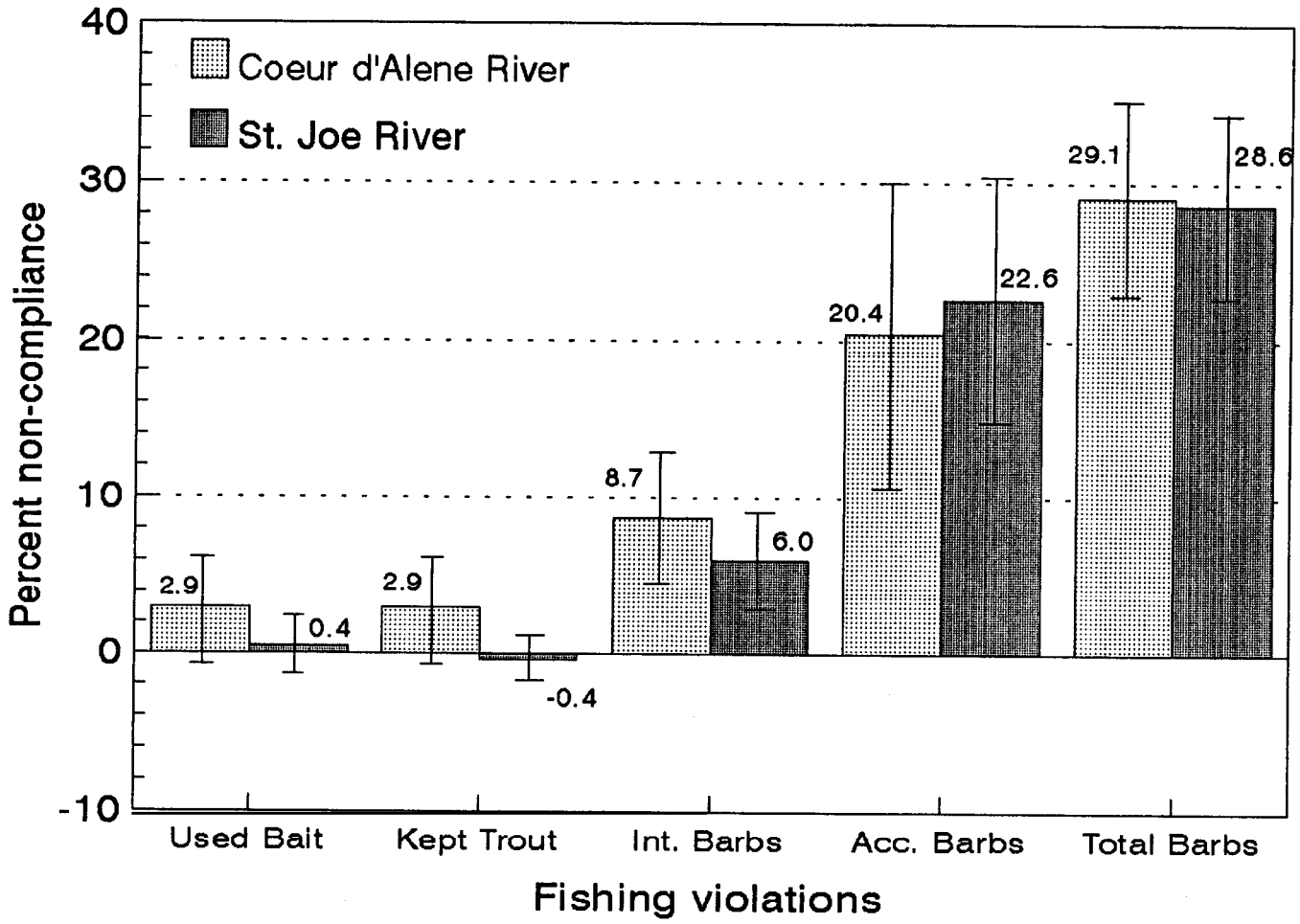

Figure 2. Random Response estimates of angler non-compliance on two Idaho stream zones managed under catch-and-release regulations, May-August, 1993. Bars denote 95% confidence limits.

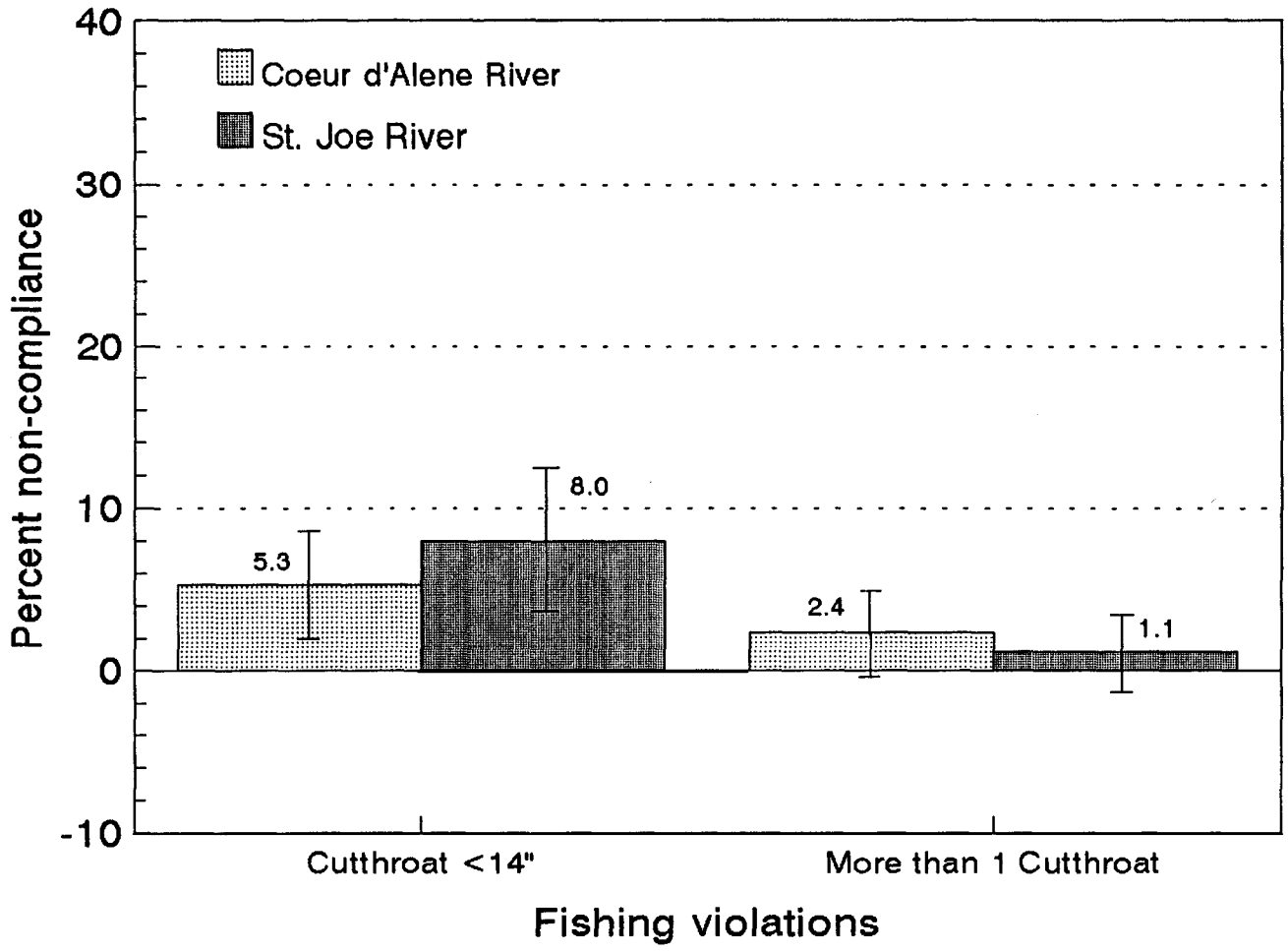

Figure 3. Random Response estimates of angler non-compliance on two Idaho stream zones managed with a one-fish bag and a 14" minimum size limit, May-August 1993. Bars denote 95% confidence limits.

activity may be due to party fishing (giving creeled fish to others in party). Several anglers volunteered this openly after replying "yes" in the RR interview.

Model Validation

IDFG personnel surreptitiously observed a total of 107 anglers fishing at OP sites during the study. Anglers fished an average of 39 min. Only 30 anglers caught cutthroat trout during this period and would have had an opportunity to violate the zero-fish bag limit.

Estimates of non-compliance derived from surreptitious observations were nearly identical to RR results. We observed a single angler (0.9%) violating the bait restriction while fishing in the C&R zone near an OP site. This individual was not using bait himself but was observed placing a worm on a child's hook. Both RR and surreptitious estimates of non-compliance with the bait restriction were less than 1.0% and 95% confidence limited overlapped (Figure 4).

Both estimates for illegal creeling of cutthroat trout were even lower, regardless of the methodology used. The surreptitious and RR methods yielded estimates of 0.0% and 0.4%, respectively.

The incidence of barbed hook use as derived from RR exceeded that of the officer patrol validation. Based on RR, we estimate that 27.5% of St. Joe River anglers fishing the C&R zone violate the barbless regulation each angler trip. The enforcement officer observed 11 confirmed cases of barbless hook violation (9.6%). If we include all "cutters" in the officer patrol estimate, we derive a barbless violation rate of 21.7%. An unknown proportion of the cutting incidents may have been bait or multiple hook violations, however.

Violator Demographics

For individual regulation zones, we observed few associations among demographic characteristics and angler awareness of regulations. Anglers with less than 13 years of education were more likely ($P < 0.05$) to recite the 1 > 14" regulation correctly on the Coeur d'Alene River than college educated individuals. On the St. Joe River 1 > 14" zone, lure fisherman were less aware ($P < 0.05$) of the regulation than bait and fly anglers. Sample sizes limited many of the comparisons, however. Small cell frequencies resulted in unusable tests of significance for most groups (Table 3; Appendices Al-A5).

In contrast, for the pooled data, we observed a number of associations between regulation awareness and demographic categories. We calculated statistically significant differences among angler groups based on age, time of week, residence, and gear type used. Only sex and education categories were not associated with regulation awareness.

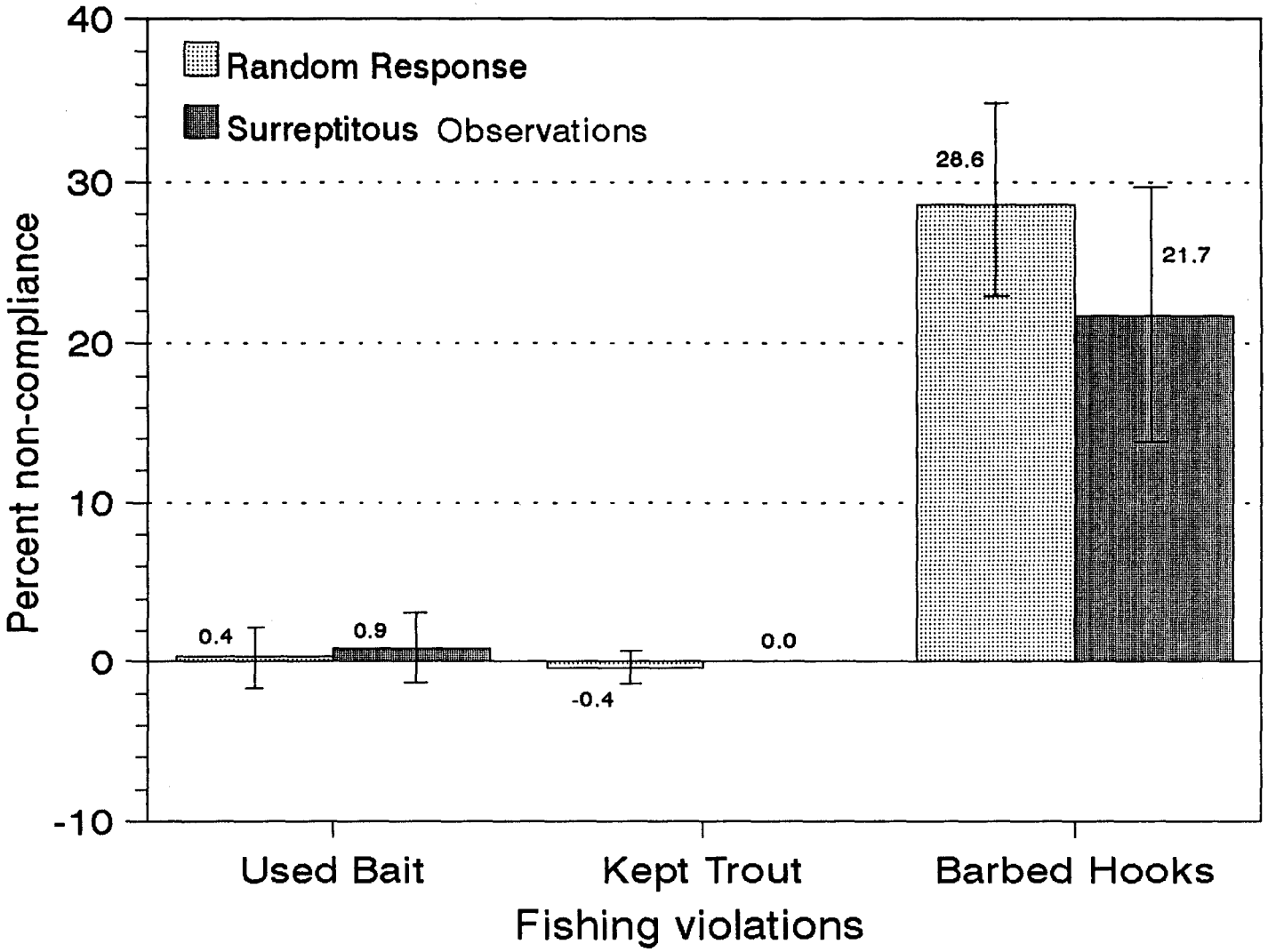

Figure 4. Comparison of non-compliance estimates for the St. Joe River catch-and-release zone from random response interviews and surreptitious observations, May-August 1993. Bars denote 95% confidence limits.

Table 3. Percent of anglers able to recite the current special regulation when interviewed on the five study zones, May-September 1993, samples size in parenthesis. * denotes significant at 0.05 level. All other variables not testable or NS.

Sex		Age (years)						Education[a]			Time of week[b]		Residence[c]				Gear		
M	F	14-20	21-30	31-40	41-50	51-60	>60	<13	13-16	>16	WE	WD	LOC	ID	EWA	Other	Bait	Lure	fly
Coeur d'Alene River 1>14"																			
70	57	76	57	67	56	92	81	77*	57	58	66	76	72	100	47	50	71	74	64
(135)	(21)	(21)	(30)	(30)	(41)	(13)	(16)	(73)	(65)	(12)	(122)	(34)	(128)	(1)	(19)	(8)	(35)	(34)	(78)
St. Joe River 1>14"																			
67	72	52	66	81	83	67	69	67	79	55	72	71	74	73	71	65	77	43*	74
(125)	(18)	(25)	(29)	(42)	(29)	(9)	(13)	(66)	(70)	(11)	(97)	(51)	(76)	(15)	(31)	(26)	(48)	(14)	(70)
Coeur d'Alene River C&R																			
93	86	89	81	95	90	100	100	92	91	91	89	100	93	100	88	81	0	86	94
(147)	(14)	(4)	(27)	(44)	(46)	(15)	(12)	(51)	(79)	(33)	(125)	(39)	(120)	(3)	(25)	(16)	(2)	(14)	(147)
St. Joe River C&																			
96	100	100	91	94	98	100	100	97	96	97	95	98	97	100	94	97		100	96
(240)	(31)	(14)	(55)	(71)	(85)	(25)	(30)	(58)	(134)	(87)	(188)	(92)	(70)	(30)	(93)	(87)		(11)	(261)
Henrys Lake 2 fish creel limit																			
98	92	82	96	100	98	100	97	94	100	100	96	100	98	96		98	99	95	98
(165)	(24)	(11)	(25)	(44)	(46)	(37)	(30)	(86)	(83)	(24)	(135)	(60)	(92)	(50)		(53)	(65)	(43)	(55)

[a] Years of education achieved for those anglers >20 years old.

[b] WE = weekends, WD = weekdays.

[c] LOC = Region 1 anglers, ID = all other State residents, EWA = eastern one third Washington anglers, Other = all other non-residents.

Within individual zones, no significant differences resulted when comparing affirmative RR responses across demographic groups. None of the pooled comparisons were statistically significant either (Table 4).

DISCUSSION

One benefit of doing RR surveys on sensitive topics is a reduction of survey refusals (Goodstadt and Gruson 1975). A total of three anglers out of 1,062 (0.3%) refused to participate in the RR portion of the interview. Two of these events occurred on the Coeur d'Alene C&R zone and one on Henrys Lake. The Henrys Lake angler was in obvious violation at the time of the refusal. One angler was unable to understand the dice game; we suspect he was illiterate. The other angler was simply unwilling to play. We have no way of knowing about compliance on any of these anglers last fishing trips. Recalculation of non-compliance estimates assuming all refusal anglers were violators would have virtually no effect on our results, however.

Our non-compliance estimates apply to the population of anglers fishing various zones but do not necessarily indicate what proportion of anglers would violate the bag limits if they could. Many anglers in these fisheries do not catch a cutthroat trout on an angling day (Hunt, University of Idaho, unpublished data). If everyone we had interviewed had caught a trout, the proportion of illegal bag or size limit violations would likely have increased. Fish populations are probably buffered from poaching to some extent simply because many anglers do not catch enough fish to exceed a limit.

Our results on accidental versus intentional violation of barbless hook regulations may have implications for fishery management agencies. Seventy-five percent of the reported barbless hook violations were accidental. Many anglers indicated they typically comply with regulations but sometimes forget to crimp barbs on individual flies and lures for short periods. Despite the recent paper of Taylor and White (1992), a preponderance of past authors have concluded no differences in hooking mortality between barbed and barbless hooks (Wydoski 1977; Mongillo 1984; Hunsaker 1970; Falk et al 1974; Titus and Vanicek 1988; Dotson 1982). If 75% of barbless hook citations are written to anglers attempting to comply with the law and the violated regulation has no demonstrated effect biologically, maintenance of such restrictions may be self-defeating for regulatory agencies. The animosity generated by issuing such citations to largely compliant anglers may be counterproductive.

Common violation of the barbless regulation may reduce angler satisfaction with a fishery. Most trout anglers fishing special regulation areas would have their satisfaction lowered if they saw other anglers violating regulations (Gigliotti 1989). Thus, the effect of widespread non-compliance with the barbless regulation may have important social consequences even if biological effects are benign.

Results of our validation efforts on the St. Joe River C&R zone agreed well with RR estimates. Point estimates were similar and confidence limits

Table 4. Pooled summary of regulation knowledge (% able to recite) and frequency of individual anglers responding yes to any Random Response question in four northern Idaho study sections, May through August 1993. Sample size in parenthesis.

Sex		Age (years)						Education[A]			Time of week[B]		Residence[C]				Gear		
M	F	14-	21-30	31-40	41-50	51-60	>60	<13	13-16	>16	WE	WD	LOC	ID	EWA	Other	Bait	Line	Fly
Percent able to recite regulation																			
82 (813)	88 (108)	75 (80)	80 (172)	90 (229)	88 (251)	96 (99)	92 (104)	85 (335)	87 (431)	90 (167)	85 (668)	91 (276)	96 (386)	100 (47)	96 (156)	98 (119)	84	82 (152)	89 (116)
X^2 = 2.4 NS		X^2 = 29.3 P < 0.001						X^2 = NS			X^2 = 5.2 P < 0.24		X^2 = 7.7 P < 0.05				X^2 = 6.0 P < 0.05		
Percent replying vest to any Random Response question																			
10 (817)	9 (109)	8 (98)	13 (197)	9 (264)	9 (272)	6 (110)	12 (108)	10 (384)	9 (485)	10 (178)	10 (768)	8 (290)	10 (470)	14 (102)	7 (188)	9 (198)	11 (153)	14 (117)	9 (615)
X^2 = 0.8 NS		X^2 = 4.6 NS						X^2 = 0.2 NS			X^2 = 1.3 NS		X^2 = 4.0 NS				X^2 = 2.5 NS		

[A]Years of education achieved for those anglers >20 years old.

[B]WE = weekends, WD = weekdays.

[C]LOC = Region 1 anglers, ID = all other State residents, EWA = eastern one third Washington anglers, Other = all other non-residents.

overlapped in all instances. We observed a single angler using bait at an OP site within the C&R zone. In fact, this angler was not using bait himself but was observed putting a worm on his son's hook. An enforcement officer also observed another angler standing in the 1 > 14" zone and casting bait under a bridge in the C&R zone in apparent violation. We did not include this angler in our validation calculations however. He would likely have been interviewed in our survey as legally fishing the 1 > 14" zone. In addition, the conservation officer observing the incident did not issue a citation for this behavior as it would not typically be sustained in court as a violation (Kevin Olson, IDFG, personal communication). If this angler is included as a bait violator in the validation, resultant confidence limits still overlap with those from the RR estimate.

An important limitation of our validation design is that anglers were only observed for a portion of their angling day. Only 28% of the anglers caught a cutthroat trout during this time period. Thus many anglers we observed did not have opportunity to violate the bag limit. Despite the small resultant sample size (n = 30) the fact that none of the successful anglers were observed keeping a trout provides us with some degree of confidence in our low RR estimate. In addition, the officer conducting the patrol validation of barbless hook use observed no cutthroat trout when checking 115 anglers.

It is also possible that anglers would violate the bait restriction elsewhere during their angler day and not at the OP site. This possibility seems remote. Anglers violating regulations because of a lack of awareness would violate all the time. We surreptitiously observed anglers for an average of 39 min. We believe anglers intentionally violating bait restrictions would likely do so during that time.

Given the limitations discussed above, the resemblance of the RR and Validation estimates of non-compliance were quite striking (Figure 4). We believe these results provide a reasonable validation of the method. A better validation would be obtainable by surrepiciously observing anglers at a small special regulation pond with suspected high rates of non-compliance. In this scenario, anglers could be observed for their entire angling day.

There are several other limitations to our RR methods. We assumed anglers could accurately remember whether they committed violations on their last angling trip. Recall is often not 100% accurate in recreation studies (Chase and Harada 1984; Hiett and Worrall 1977). During initial moments of our RR interviews, anglers were asked if they could remember specifics about their last trip. Accurate recall of barbless violations, particularly accidental ones, may be questionable and may be more of an estimate. We believe anglers committing violations of the bait, bag, or size restrictions would accurately remember the violations, however, especially intentional violators.

We obtained a negative estimate of non-compliance with the zero fish bag limit on the St.Joe River C&R zone suggesting questionable RR model performance. It is possible that we obtained a negative estimate simply by chance. The surreptitious validation study found no anglers keeping cutthroat

trout (0%) on this zone. If this was true and an unusually low number of survey respondents rolled a 6 or were not born in the month of April, then a negative estimate could occur.

It is also possible, however, that the negative estimate reflects individuals unwilling to be truthful. IDFG personnel may simply not be able to convince violators to answer truthfully. Enforcement of fish and game laws is one of the most visible aspects of wildlife agencies and it may be difficult to assure some violators that IDFG researchers are not interested in individual responses. The fear that somehow their responses could result in a citation despite privacy protection mechanisms could be very hard to overcome. Locander et al. (1976) reported on the effects of question threat on response bias in surveys. The magnitude of response bias was statistically significant along the stigmatizing threat dimension, being lowest for voter registration and greatest for a drunken driving charge.

Wright (1980) suggested that RR surveys should not be done by fish and wildlife personnel for this reason. In a pilot study on the Coeur d'Alene River in 1992 (Schill and Kline 1994), we attempted to overcome this fear by interviewing anglers in private vehicles and "civilian" clothes. This seemed to only create confusion since we felt obligated to inform them we were IDFG employees. Also, many wading anglers were reluctant to have their fishing interrupted by a "civilian". We eventually settled on using IDFG uniform shirts on the streams. No uniform apparel was used on Henrys Lake where anglers were more easily contacted on shore.

We believe that "uniform shock" or general fear of IDFG personnel can be mitigated by judicious selection of interview personnel and proper training. It has been demonstrated that individual interview personnel can influence survey responses and ultimately study results (Frey 1980). This would seem particularly true of RR surveys. The selection and training of people who can interact easily with the public and can honestly assure respondents of their lack of interest in individual answers should reduce the incidence of dishonest responses. Prospective interview personnel with a strong interest in enforcement activities should probably be avoided.

Another reason actual violators may not want to answer truthfully would be the fear that high stream-wide violation rates could result in stepped-up law enforcement efforts in general. Results from past RR surveys on topics with much more stigmatizing potential suggest that members of a sensitive group will in fact cooperate with RR surveys. One would expect fear of stepped-up enforcement activities such as drug use and exam cheating would be great but RR results have been successfully used in these and other instances (Horvitz et al. 1976,Shotland and Yankowski 1982; Fiddler and Kleinknecht 1977; Goodstadt and Gruson 1975; Lamb and Stem 1978).

In addition to studies in Idaho (Lewynsky 1986; Rohrer 1991; and Schill and Kline 1994), we have found only two other wildlife-related studies that have used RR. Smith (1989) used RR to estimate frequency of fishing without a license in Colorado. An estimated 22% of respondents had fished at least once during the past year without one. Wright (1980) estimated the numbers of Iowa deer poached illegally by farmers alone was about equal to the legal take.

Random Response has received little attention from fish and wildlife agencies, perhaps for several reasons. The methodology is confusing for the average person to comprehend (Smith 1989) and explaining to respondents how it results in useful information is sometimes difficult. Much of the RR literature is in statistical journals replete with complex mathematical formulas and discussions of variance efficiencies, optimal allocation of sample size and other statistical jargon (Greenberg et al. 1969; Moors 1971; Folsom et al. 1973). These probably deter biologists from using the method. It has been suggested that even the name Random Response is confusing since it is the question and not the response that is stochastic (Brown 1975; Bourke and Dalenius 1976). These authors suggested the technique be called randomized inquiry. Despite possible confusion it is not necessary for survey respondents to understand how the technique works. Anglers must only believe that their privacy is protected in order for RR to work (Smith 1989).

Traditional methods of gauging compliance with regulations may not be useful biologically. In Idaho, the most common measure is the simple ratio of violations to field checks by enforcement personnel. The use of surreptitious observations is difficult logistically and manpower intensive. Officer patrol and surreptitious data needs to be collected more randomly if it is to be used as an indicator of violation rates for biological purposes (Cowles et al. 1979). RR methods provide the flexibility to do this with lower manpower costs.

Having estimated the frequency of angling violations, we hope to evaluate biological effects of poaching on the study zone populations in future work. Recent estimates of angler use are available for all three waters (IDFG, unpublished data). This data combined with the non-compliance estimates will allow us to calculate the number of violation-days occurring on each study zone. Unfortunately, like Cowles et al. (1979), we have no idea how many violations each individual commits per day in the field. For example, we have no estimate of how many fish the average poacher fishing the St.Joe River on the 1 > 14" zone may keep during an angler day. A quantitative variation of the traditional RR model (Greenburg et al. 1971; Horvitz 1976; Fox and Tracy 1986) may facilitate these estimates and could be investigated in the future. Another approach would be to use a range of likely values based on creel census data.

In the future, we plan to combine illegal bait losses and angler harvest with population estimates in each zone to estimate illegal exploitation. A simulation study similar to Gigliotti and Taylor (1990) will then be used to evaluate the biological effects of poaching on the study zones.

Guidelines for RR model design are available. We followed the detailed guidelines from the original paper (Greenburg et al. 1969) in our study and selected P at 0.17 and ny = 0.8. Several more recent authors have pointed out limitations to this approach, however. Folsom et al. (1973) suggest using a coin toss as the randomizing device which would result in the sensitive question being asked in 50% of interviews. Fox and Tracy (1986) agree with this approach and also encourage the selection of an unrelated question with a better likelihood of answering with a yes. These changes will result in less precision but should provide further privacy protection for individuals

skeptical of the technique. We recommend using this approach in future studies.

Our comparison of RR responses across demographic groups did not identify any covariates. Our sample sizes for individual zones were small and the number of yes responses were limited because of apparent good compliance. In addition, the power of categorical tests will be diminished by the nature of the random error introduced by the randomized response procedure (Fox and Tracy 1986).

Several other authors have successfully classified violators, however. Smith and Smeltzer (1991) noted a clear tendency for young fisherman to fish without a license in Colorado. Glover and Baskett (1984) estimate that unemployment was 30 times more likely in Missouri deer poachers than in legal hunters. Poachers were also more likely to drink while hunting and tended to be younger than the general population. Authors of both studies noted the value of this information for enforcement personnel but stressed its real importance was to aid in education efforts for violator groups.

We observed statistically significant differences in regulation awareness for several angler groups on the two streams. Young anglers under age 30 were least able to correctly recite the regulations. This would place them at greater risk for citations as noted in above studies. Bait and lure anglers gave fewer correct responses than fly fisherman. Weekend anglers were less informed than weekday anglers. Local and eastern Washington anglers were not as aware of regulations as other Idaho residents and non-residents. These observed differences could be useful to IDFG in devising cost-effective education programs designed to minimize violations.

Our study also identified substantial differences in regulation awareness among regulation zones. Angler awareness of the simple two-fish bag limit at Henrys Lake was good. On streams, anglers fishing C&R zones were much more likely to know the regulation than those fishing 1 > 14" zones. While there are no gear restrictions on the 1 > 14" zones, these regulations are more complex because a general six-fish bag limit is in effect for rainbow trout. Many anglers may not have the capacity or interest in understanding complex special regulations such as those for the two 1 > 14" zones.

Conclusions

We conclude that RR is a viable method to estimate angler compliance with special regulations. Our estimates show that non-compliance with regulations that directly limit angler harvest was less than 10%, and most often less than 5%. Additional data are needed to evaluate potential biological effects of these rates on associated trout populations.

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A P P E N D I C E S

Appendix A-1. Summary of demographics and regulation knowledge/compliance for anglers fishing in the St. Joe River catch-and-release zone (Prospector Creek to Spruce tree), June 5 to August 28, 1993.

		Sex		Age						Education[a]			Time		Residence				Gear[d]	
Regulations		M	F	14-20	21-30	31-40	41-50	51-60	60+	<13	13-16	>16	WE	WD	LOC	ID	EWA	Other	Bait	Fly
Respondent	yes	192	29	13	47	58	73	22	26	44	113	81	163	76	65	29	73	72	8	218
in visual	no	9	0	0	4	4	1	0	0	4	2	3	8	1	2	0	7	0	1	6
compliance?[a']	% yes	96	100	100	92	94	99	100	100	92	98	96	95	99	97	100	91	(100)	(89)	(97
	n	201	29	13	51	62	74	22	26	48	115	84	171	77	67	29	80	72	9	224
Did	yes	230	31	14	50	67	83	25	30	56	128	84	17	90	68	30	87	84	11	250
respondent	no	10	0	0	5	4	2	0	0	2	6	3	9	2	2	0	6	3	0	11
know	(% yes)	(96)	(100)	100	91	94	98	100	100	(97	(96)	(97	95	98	(97	(100)	(94)	(97)	100	96
regulations?	n	240	31	14	55	71	85	25	30	58	134	87	188	92	70	30	93	87	11	261
Respondent	yes	22	1	2	7	8	4	0	3	5	10	9	19	5	7	2	9	6	3	21
reply yes	no	219	30	12	50	69	88	26	27	53	134	84	185	87	72	29	89	82	9	240
to any	X yes	9	0.3	14	12	10	4	0	10	9	7	10	9	5	9	6	9	7	25	8
random	n	241	31	14	57	77	92	26	30	58	144	93	204	92	79	31	98	88	12	261
response question.[e]																				

[a] Excludes individuals contacted at campsites, etc.

[b] Years of education achieved for those anglers over 20 years of age.

[c] LOC = Region 1 anglers, ID = all other Idaho residents, EWA = Eastern Washington, Other = All other non-residents.

[d] Does not include anglers using multiple gears.

[e] Does not include question on accidental use of barbed hooks.

Appendix A-2. Summary of demographics and regulation knowledge/compliance for anglers fishing in the St. Joe River 1 > 14" zone (Prospector Creek to Spruce tree), June 5 to August 28, 1993.

		Sex		Age					Education[b]			Time		Residence[c]			Gear[d]			
Regulations		M	F	14-20	21-30	31-40	41-50	51-60	60+	<13	13-16	>16	WE	WD	LOC	ID	EWA	Other	Bait	Line	Fly
Respondent in visual compliance?[a]	yes	103	15	26	33	41	27	7	7	67	64	10	105	37	77	14	33	18	44	10	55
	no	3	0	0	2	0	0	0	1	1	1	1	2	1	2	0	0	1	0	0	3
	X	97	100	100	94	100	100	100	88	99	98	91	98	97	97	100	100	95	100	100	95
	n	106	15	26	35	41	27	7	8	68	65	11	107	38	79	14	33	19	44	10	58
Did respondent know regulations?	yes	90	12	13	19	34	24	6	9	44	55	6	70	36	56	11	22	17	37	6	52
	no	35	6	12	10	8	5	3	4	22	15	5	27	15	20	4	9	9	11	8	18
	% yes	67	72	52	66	81	83	67	69	67	79	55	72	71	74	73	71	65	77	43	74
	n	125	18	25	29	42	29	9	13	66	70	11	97	51	76	15	31	26	48	14	70
Respondent reply yes to any random response question.[e]	yes	12	1	5	2	7	2	0	1	7	9	1	14	3	10	4	1	2	5	0	5
	no	115	17	28	34	42	31	9	12	76	69	11	109	48	84	13	35	25	44	14	66
	X	9	6	15	6	14	6	0	8	8	12	8	11	6	11	24	3	7	10	0	7
	n	127	18	33	36	49	33	9	13	83	78	12	123	51	94	17	36	27	49	14	71

[a] Excludes individuals contacted at campsites, etc.

[b] Years of education achieved for those anglers over 20 years of age.

[c] LOC = Region 1 anglers, ID = all other Idaho residents, EWA = Eastern Washington, Other = All other non-residents.

[d] Does not include anglers using multiple gears.

[e] Does not include question on accidental use of barbed hooks.

Appendix A-3. Summary of demographics and regulation knowledge/compliance for anglers fishing in the Coeur d'Alene River catch-and-release zone (Yellow Dog Creek to Tepee Creek), May 29 to August 22, 1993.

		Sex		Age						Education[b]			Time			Residence[c]			Gear[d]		
Regulations		M	F	14-20	21-30	31-40	41-50	51-60	60+	<13	13-16	>16	WE	WD	LOC	ID	EWA	Other	Bait	line	Fly
Respondent	yes	119	9	4	23	41	44	15	12	35	72	33	104	36	99	3	22	16	0	3	127
in visual	no	4	2	0	4	1	2	0	0	4	3	0	7	0	7	0	0	0	2	2	2
compliance?[a]	% yes	97	82	100	85	98	96	100	100	90	96	100	94	100	93	100	100	100	0	60	98
	n	123	11	4	27	44	46	15	12	39	75	33	111	36	106	3	22	16	2	5	129
Did	yes	136	12	8	26	40	45	15	15	47	72	30	111	39	112	3	22	13	0	12	138
respondent	no	11	2	1	6	2	5	0	0	4	7	3	14	0	8	0	3	3	2	2	9
know	X yes	93	86	89	81	95	90	100	100	92	91	91	89	100	93	100	88	81	0	86	94
regulations?	n	147	14	9	32	42	50	15	15	51	79	33	125	39	120	3	25	16	2	14	147
Respondent	yes	19	5	1	7	5	8	2	3	9	12	5	18	8	23	0	1	2	2	4	18
reply yes	no	129	9	11	29	45	43	16	14	51	77	30	122	37	114	3	27	15	0	10	130
to any	% yes	13	36	8	19	10	16	11	18	15	13	14	13	18	17	0	4	12	100	29	12
random	n	148	14	12	36	50	51	18	17	60	89	35	140	45	137	3	28	17	2	14	148
response question.[e]																					

[a] Excludes individuals contacted at campsites, etc.

[b] Years of education achieved for those anglers over 20 years of age.

[c] LOC = Region 1 anglers, ID = all other Idaho residents, EWA = Eastern Washington, Other = All other non-residents.

[d] Does not include anglers using multiple gears.

[e] Does not include question on accidental use of barbed hooks.

Appendix A-4. Summary of demographics and regulation knowledge/compliance for anglers fishing in the Coeur d'Alene River 1 > 14" zone (Prichard Creek to Yellow Dog Creek), May 29 to August 22, 1993.

Regulations		Sex		Age						Education[b]			Time		Residence[c]				Gear[d]		
		M	F	14-20	21-30	31-40	41-50	51-60	60+	<13	13-16	>16	WE	WD	LOC	ID	EWA	Other	Bait	Line	Fly
Respondent in visual compliance?[a]	yes	106	18	23	35	35	38	16	11	71	77	9	128	35	131	1	21	10	27	27	63
	no	3	0	0	1	0	2	0	1	2	2	0	3	1	3	0	0	1	1	0	1
	% yes	97	100	100	97	100	95	100	92	97	97	100	98	97	98	100	100	91	96	100	98
	n	109	18	23	36	35	40	16	12	73	79	9	131	36	134	1	21	11	28	27	64
Did respondent know regulations?	yes	94	12	16	17	20	23	12	13	56	37	7	80	26	92	1	9	4	25	25	50
	no	41	9	5	13	10	18	1	3	17	28	5	42	8	36	0	10	4	10	9	28
	% yes	70	57	76	57	67	56	92	81	77	57	58	66	76	72	100	47	50	71	74	64
	n	135	21	21	30	30	41	13	16	73	65	12	122	34	128	1	19	8	35	34	78
Respondent reply yes to any random response question.[e]	yes	14	1	0	6	2	6	2	1	8	8	1	12	5	12	0	2	3	4	5	5
	no	121	21	28	36	42	44	18	17	88	83	13	153	37	156	1	24	9	31	29	74
	% yes	10	5	0	14	5	12	10	6	8	9	7	7	12	7	0	8	25	11	15	6
	n	135	22	28	42	44	50	20	18	96	91	14	165	42	168	1	26	12	35	34	79

[a] Excludes individuals contacted at campsites, etc.

[b] Years of education achieved for those anglers over 20 years of age.

[c] LOC = Region 1 anglers, ID = all other Idaho residents, EWA = Eastern Washington, Other = All other non-residents. "

[d] Does not include anglers using multiple gears.

[e] Does not include question on accidental use of barbed hooks.

Appendix A-5. Summary of demographics and regulation knowledge/compliance for anglers fishing Henry's Lake, May 29 to September 5, 1993.

		Sex		Age						Education[b]			Time		Residence[c]			Gear[d]		
Requtations		M	F	14-20	21-30	31-40	41-50	51-60	60+	<13	13-16	>16	WE	WD	LOC	ID	Other	Bait	Line	Fly
Respondent in visual compliance?[a]	yes	100	11	6	15	26	28	21	17	46	50	17	78	37	52	23	40	36	24	43
	no	6	0	0	1	1	2	1	1	3	2	1	4	2	2	2	2	1	0	1
	X yes	94	100	100	94	96	93	95	94	94	96	94	95	95	96	92	95	97	100	98
	n	106	11	6	16	27	30	22	18	49	52	18	82	39	54	25	42	37	24	44
Did respondent know regulations?	yes	162	22	9	24	44	45	37	29	81	83	24	130	60	90	48	52	66	41	54
	no	3	2	2	1	0	1	0	1	5	0	0	5	0	2	2	1	1	2	1
	% yes	98	92	82	96	100	98	100	97	94	100	100	96	100	98	96	98	99	95	98
	n	165	24	11	25	44	46	37	30	86	83	24	135	60	92	50	53	67	43	55
Respondent reply yes to any random response question.[e]	yes	15	2	0	3	3	4	3	5	10	6	2	16	2	6	8	4	6	4	7
	no	150	22	11	22	41	42	34	25	76	77	22	119	58	86	42	49	61	39	48
	% yes	9	8	0	12	7	9	8	17	12	7	8	12	3	7	16	8	9	9	13
	n	165	24	11	25	44	46	37	30	86	83	24	135	60	92	50	53	67	43	55

[a] Excludes individuals contacted at campsites, etc.
[b] Years of education achieved for those anglers over 20 years of age.
[c] LOC = Region 6 anglers, ID = all other Idaho residents, Other = All non-residents.
[d] Does not include anglers using multiple gears.
[e] Does not include question on accidental use of barbed hooks.

Appendix A-6. Summary of demographics and regulation knowledge/compliance for anglers fishing in any of the four St. Joe River/Couer d'Alene River study sections, June to August 1993.

Regulations		Sex		Age						Education[b]			Time		Residence[c]				Gear[d]		
		M	F	14-20	21-30	31-40	41-50	51-60	60+	<13	13-16	>16	WE	WD	LOC	ID	EWA	Other	Bait	Line	Fly
Respondent in visual compliance?[a]	yes	521	71	66	139	175	182	60	56	264	375	150	501	184	372	47	149	117	71	48	464
	no	19	2	0	11	5	5	0	2	14	10	5	20	3	14	0	7	2	3	3	12
	%	96	97	100	93	97	97	100	97	95	97	97	96	98	96	100	96	98	96	94	97
	n	540	73	66	150	180	187	60	58	278	385	155	521	187	386	47	156	119	74	51	476
Did respondent know regulations?	yes	713	89	60	137	205	220	95	96	285	375	151	571	251	418	93	140	171	128	95	545
	no	100	19	20	35	24	31	4	8	50	56	16	97	25	68	6	28	20	24	21	67
	%	82	88	75	80	90	88	96	92	85	87	90	85	91	86	94	83	90	84	82	89
	n	813	108	80	172	229	251	99	104				668	276	486	99	168	191	152	116	612
Respondent reply yes to any random response question.[e]	yes	82	10	8	25	25	24	7	13	39	45	18	79	23	58	14	13	17	17	16	56
	no	735	99	90	172	239	248	103	95	345	440	160	689	267	512	88	175	181	136	101	559
	% yes	10	9	8	13	9	9	6	12	10	9	10	10	8	10	14	7	9	11	14	9
	n	817	109	98	197	264	272	110	108	384	485	178	768	290	570	102	188	198	153	117	615

[a] Excludes individuals contacted at campsites, etc.

[b] Years of education achieved for those anglers over 20 years of age.

[c] LOC = Region 1 anglers, ID = all other Idaho residents, EWA = Eastern Washington, Other = ALL other non-residents.

[d] Does not include anglers using multiple gears.

[e] Does not include question on accidental use of barbed hooks.

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